

had seriously affected the usual conditions. A portion of the spring water is obtained from surface run-off as indicated by the lessening volume of the spring on the third day. Small rills entered the dam and a large one entered the creek about one hundred feet below the dam. Those entering the dam had dried up early in the morning of the third day but the one below the dam continued to flow throughout our stay. The change from pH 8. on the second day to that of pH 7.6 on the third day is, in all probability, due to the drying-up of the rills entering the dam. It is to be regretted that our short stay at this place prevented another reading under more normal conditions.

## READINGS

Locality	Sept. 22 2nd day	Sept. 23 3rd day
Spring . . . . .	7.4	7.4
Dam . . . . .	8.	7.6
Creek, 400 feet below dam . . . . .	8.	8.

(To be continued)

FOSSIL VIVIPARUS-LIKE CALCAREOUS OPERCULA<sup>1</sup>

BY WENDELL P. WOODRING

Pliocene *Viviparus*-like calcareous opercula (*Scaez petroli* Hanna and Gaylord) from California were briefly described in an article in the last number of THE NAUTILUS.<sup>2</sup> After this article was in type, Dr. Pilsbry called my attention to a fossil from the Eureka District of Nevada that was named *Ampullaria*?

<sup>1</sup> Published with the permission of the Director of the U. S. Geological Survey.

<sup>2</sup> Woodring, W. P., Pliocene *Viviparus*-like opercula from California. Nautilus, vol. 39, no. 4, pp. 109-111, 1926.

*powelli* by Walcott<sup>1</sup> and assigned by him to beds of lower Carboniferous age. The type material of this species shows that the shell is much more similar to *Viviparus* than would be supposed from the figure, which apparently was drawn with a living *Ampullaria* as a guide. The body whorl is not so inflated with respect to the other whorls; the spire is relatively higher; and the aperture is less elongate. Opercula that clearly belong to this species, although they have not been found in the apertures of shells, also are more viviparoid than the figure shows. These opercula, which are calcareous and are much more abundant than shells, are very similar to *Scalez petroli*a, but they are smaller and their nucleus is a little farther from the columellar edge.

Dr. T. W. Stanton, of the United States Geological Survey, also called my attention to a calcareous operculum in a collection of fossils from the Judith River formation (Upper Cretaceous) cropping out at the mouth of Meili Coulee near Havre, Montana (locality 2794, U. S. Geol. Survey register of Mesozoic invertebrate fossil localities). This operculum resembles *Scalez petroli*a, but it is a little smaller, more elongate, and its posterior end is more pointed. These beds carry a large *Viviparus*-like shell that is much too large for this operculum, unless it belonged to a young shell.

The United States Geological Survey recently received from Dr. J. C. F. Siegfriedt fossils collected from a bed of Fort Union (Eocene) age overlying the coal in the Eagle Coal Mine at Bearcreek, Montana (locality 13459, U. S. Geol. Survey register of Mesozoic invertebrate fossil localities). This collection contains calcareous opercula similar to *Scalez petroli*a, though again they are smaller and their nucleus lies a little farther from the columellar edge.

According to these records, fossil *Viviparus*-like calcareous opercula are not so rare as was supposed when the previous article was written. They have been found in beds of supposed lower Carboniferous age in Nevada, in Upper Cretaceous and

<sup>1</sup> Walcott, C. D., Fresh-water shells from the Paleozoic rocks of Nevada: Science, vol. 2, p. 808, 3 figs., 1883. U. S. Geol. Survey Mon. 8, p. 261, figs. 4, 5, 1884.

Eocene beds in Montana, and in Pliocene deposits in California. Apparently all these specimens represent the same generic type; at least all are similar to *Viviparus* and all are calcareous. No record has yet been found of living Viviparidæ that have calcareous opercula.

---

#### FURTHER NOTES ON SCALEZ PETROLIA

---

BY DR. G. DALLAS HANNA

---

This organism, presumed to be a mollusk, was originally described from operculum-like objects preserved in the upper part of the Etchegoin (Pliocene) formation of the southern end of the San Joaquin Valley, California.<sup>1</sup> Dr. W. P. Woodring<sup>2</sup> has recently recorded the finding of *Viviparus*-like shells associated with the opercula and which appear to have belonged to the same organism. For some reason the shell was exceedingly thin and delicate, yet the operculum was comparatively massively developed, a condition which is presumed to have been brought about by the changing of the old Etchegoin marine sea to the Tulare freshwater lake.

The organism did not last long as would be expected of such a specialized development, but it grew in prodigious abundance while it did exist. A few feet of strata mark its vertical range and for this reason it has become one of the best "markers" of a definite zone yet discovered in petroleum geology. It likewise had a fairly wide "horizontal" distribution, having been found in wells drilled in the center of the San Joaquin Valley, as well as for many miles, north and south, along the western border.

Unfortunately the original description contained two errors, one of which was avoidable, and this opportunity is taken to make the corrections. The type specimens came from the Midlands Oil Company's Well No. 1, Sec. 34, "T. 32 S.", R. 24

<sup>1</sup> Hanna & Gaylord, Proc. Calif. Acad. Sci. 4th ser., Vol. 13, 1924, pp. 147-149, 2 figs.

<sup>2</sup> NAUTILUS, Vol. 39, No. 4, 1926, pp. 109-111.